MARINE REVIEW.

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Test of Steamer Rappahannock.

We are this week enabled to give some of the particulars of the test of the engines and boilers of this steamer, made by a party of students from the Michigan college. The Rappahannock is a wooden, coarse freight, screw steamer built by Capt. James Davidson of West Bay City. She went into commission in July of this year. Her leading dimensions are:

Length over all	335 feet
Beam	43 feet
Depth	26 feet
Registered tonnage	1,911 tons
Displacement at 15 feet draft	4,500.6 tons

The engines are triple expansion, built by the Frontier Iron Works of Detroit, and are 20, 32 and 54 inches diameter by 42 inches stroke. The boilers, two in number, are by Wickes Bros. of Saginaw and are 12 feet 3 inches diameter by 12 feet long, for a working pressure of 160 pounds. Each boiler has two 42-inch furnaces and 314 tubes of 2½ inches diameter. The total grate area is 84 square feet and total heating surface 3,786 square feet. Howden's system of hot draft is fitted. The cargo at the time of test consisted of 80,000 bushels of wheat, or 2,400 net tons, from Duluth on a draft of 14 feet 4½ inches.

The party, which also included Prof. Weil of the college and Mr. H. Penton of the Frontier works, boarded the steamer at Detroit on her first trip down on Saturday, July 20, and the test here summarized was made on Lake Erie on Sunday, July 21. The test was made under ordinary working conditions. No preparations of any kind were made for it except the putting in place of the apparatus needed for observations, and it is therefore a faithful record of the steamer's every-day work. The coal used was ordinary run of mine, costing about $2 a ton at Lake Erie ports. The feed water was measured by a carefully tested water meter and the scales used were also tested. The boiler test extended over ten hours. For 4 hours and 15 minutes indicator cards were taken from the engines every fifteen minutes, and also readings of meter, temperatures, steam, vacuum and revolutions; during the balance of test every thirty minutes. The fuel and water consumption per I. H. P. are therefore referred to the time during which observations were made most frequently. The moisture in coal was found by placing a carefully weighed quantity over the boilers and allowing it to dry for about sixteen hours.

Duration of boiler test	10 hours
Duration of engine test	4.25 "
Cargo, net tons	2,400
Load draft	14 ft. 4½ inches
Speed per hour, miles per log, mean	12.75
Revolutions per minute, mean	85.08
Steam pressure at throttle, mean	153.5
Vacuum, mean	21 inches
I. H. P., mean	1,167.34
Total coal burned, lbs	20,255
Total ashes, lbs	1,670
Per cent. of ashes	8.59
Per cent. of moisture in coal	4.
Total combustible, lbs	17,774.8
Total feed water, lbs.	156,456
Water evaporated per lb. dry coal, lbs.	8.04
Water evaporated per lb. combustible, lbs	8.76
Steam used by auxiliaries per hour, lbs	840.7
Dry coal per hour, lbs	1,944.48
Feed water to boilers, (during engine test), lbs	70,103.75
Coal per I. H. P. per hour, lbs.	1.75
Combustible per I. H. P. per hour, lbs.	1.4
Water per I. H. P. per hour, lbs.	14.07
Water per I. H. P. per hour, lbs (auxiliaries deducted)	13.07
I. H. P. per square foot of grate	13.89
Coal per square foot of grate per hour, lbs	24.11
Total weight of machinery, lbs	206,400
Weight per I. H. P. lbs	176.81
Weight of boilers and fittings, including water and draft apparatus, lbs	250,000
Weight per I. H. P.	214.16
Weight per I. H. P. of whole plant, lbs	390.97
Ton miles per hour	30,600
Coal per ton mile, oz.	1.01
Miles per ton cargo for 1 c. fuel	157.2

This is equivalent to carrying one ton one mile for $\frac{53}{100}$ of a mill at the rate of 12.75 miles per hour.

The exhaust steam from auxiliaries was all conducted to a Wheeler condenser, and condensed and weighed. After the conclusion of the regular test the exhaust from each auxiliary was condensed and weighed separately as a check on previous observations and to ascertain the amount of steam used by each. The results agreed, and the steam used by deck pump was found to be 158 pounds per hour, the blower engine 222 pounds and the feed pump 460 pounds.

Leaving out the deck pump, which was only used to furnish cooling water for the condenser, it appears that the steam used by the auxiliaries in regular service is equal to .57 pounds per I. H. P. per hour. Thus at the observed rate of evaporation the blower engine used 28.7 pounds of coal per hour, costing for twenty-four hours 69 cents. Similarly, the feed pump used 59.5 pounds of coal per hour, costing $1.42 per twenty-four hours.

An interesting point is a comparison of the efficiencies of the plant as between Lake Erie and Lake Superior. The observed temperature of the water of Lake Erie was 73.5 to 75 degrees Fahr.; consequently it was almost impossible to obtain a better vacuum without the use of excessive quantities of injection water as to practically prohibit it. With the same or even a less quantity of injection on Lake Superior, where the temperature was 45 degrees, it was possible to obtain 24 inches vacuum without difficulty.

The increase in I. H. P. would be easily 125, which would not cost one cent, and the apparent fuel and water consumption per I. H. P. would be reduced nearly 11 per cent.

It should be added that the engines are capable of a sustained I. H. P. of over 1,500, a sister ship, the Shenandoah, having exceeded this figure under natural draft. That the Rappahannock is a fast boat for a freighter is evident, and the figures show that so far as information is available her engines have not been even approached in economy (except in a few notable instances) by any on the lakes.

The test was conducted entirely by Messrs Goodenough and Parrish, assisted by Prof. Weil and by Messrs. McKinnon and Crawford, and the results have been condensed and arranged in the form in which they are presented here by Mr. H. Penton.

Cargo and Speed Records—Lake Freight Steamers.

As was expected the first of the 400-foot steel freighters, the steamer Victory, has surpassed all previous records for big Lake Superior cargoes with her first load of ore from Two Harbors. She carried 3,689 gross, or 4,132 net tons, through the canal on an average draft of 14 feet 3 inches. The Victory will in the course of two or three weeks be sent to Escanaba to take a cargo of ore to South Chicago, and with 18 feet draft afforded between the Lake Michigan ports, the expectation of a lake steamer carrying more than 6,000 net tons will undoubtedly be realized. A corrected cargo and speed table follows:

Iron ore—S. S. Curry, Hawgood & Avery Transit Co. of Cleveland, 4,569 gross or 5,117 net tons, Escanaba to South Chicago; Maritana, Minnesota Steamship Co. of Cleveland, 4,260 gross or 4,771 net tons, Escanaba to South Chicago; Selwyn Eddy, Eddy Bros. of Bay City, Mich., 3,897 gross or 4,364 net tons, Escanaba to Ashtabula. Lake Superior cargoes, ore—Victory Inter-Lake Co. of Cleveland, 3,689 gross or 4,132 net tons, Escanaba to Ashtabula on draft of 14 feet 3 inches.

Grain—Selwyn Eddy, Eddy Transportation Co. of Bay City, 130,820 bushels of wheat, Detroit to Buffalo; Centurion, Hopkins Steamship Co. of St. Clair, Mich., 152,000 bushels of corn, Chicago to Buffalo; S. S. Curry, Hawgood & Avery Transit Co of Cleveland, 246,673 bushels of oats, Chicago to Buffalo.

Coal—S. S. Curry, Hawgood & Avery Transit Co of Cleveland, 4,535 net tons bituminous, Conneaut to Gladstone; Selwyn Eddy, Eddy Bros. of Bay City, Mich, 4,252 net tons authracite, Buffalo to Millwaukee.

Speed—Owego, Union Line of Buffalo, Buffalo to Chicago, 889 miles, 45 hours and 16 minutes, 16 4 miles an hour; Centurion, Hopkins Steamship Co. of St. Clair, Mich.. Buffalo to Duluth, 997 miles, 67 hours and 50 minutes, 14.7 miles an hour.

Great improvements have been made of late in the presses used for printing daily newspapers. The Buffalo Enquirer of Monday, the 4th, was a 16-page paper, and it is announced that a new Hoe perfecting press on which it was printed will turn out 24,000 of such papers—printed, cut, pasted, folded, etc—in an hour. The Enquirer has taken an important part in the development of the city of Buffalo, and a couple of columns of its space are given up each day to a valuable collection of marine reading matter.

Detroit's Marine Post Office.

Postmaster Engright of Detroit is, of course, anxious to direct attention to the Detroit river postoffice service and encourage everybody interested in lake vessels to make use of the service. As indicated in the letter printed below, it is his intention to try to secure, during the coming winter, the approval of the postoffice department for the construction of a fast boat, of the harbor tug type, that will be capable of running alongside the fastest vessels passing through the rivers, so as to deliver and take mail from them without requiring any check in their speed:

Editor MARINE REVIEW: The marine postoffice service was established June 19, 1895, and during the first twelve days of operation handled in round numbers 700 pieces of mail. The report for last month, July, is as follows:

Mail received from the main office	4,396	pieces
Mail collected from vessels	2,627	"
Special delivery letters received from main office	14	"
Special delivery letters received from vessels	8	"
Telegrams received from main office	9	"
Telegrams received from boats	25	"
Total pieces handled	7,079	

This shows the increse over the amount of matter handled during the twelve days of June to be 475 per cent.

The service itself is in many respects so novel that necessarily there was much to learn from the outset, and the hazard of the present mode of delivery made the securing of good men for the service quite difficult. The operation of the service, however, has been so carefully watched and improved upon that the percentage of failures to deliver is wonderfully small. I may say, speaking without reference to the daily reports which I receive from the station, that we have not missed above 2 per cent. of the vessels for which we had mail, and the misses in most cases were owing to circumstances beyond our control, such as the missing of the line or the parting of the line thrown by the carrier to the vessels while in motion, or, in a few instances, their failure to respond to our signals. On several occasions their passages were so frequent, or rather the fleet under way opposite the city was so large, that not all the deliveries were made. It is my intention to recommend to the department the construction this fall and winter of a vessel sufficiently speedy and staunch to make the delivery direct from the vessel. The method I have not yet positively determined upon.

I have received very few complaints from the marine interests as to the failure of the service in any particular, and I think this is the best criticism which could be offered.

JOHN J. ENRIGHT,
Postmaster.

Detroit, Mich., August 8, 1895.

Electricity as a Motive Power for Ships.

Editor MARINE REVIEW: I was somewhat interested in your extract of the article in the Maritime Register on the subject of electricity as the motive power of large bodies, and particularly as it presaged the application of it to the propulsion of large sea-going vessels. The ideas expressed were called out by the successful operation of an electric locomotive on the Baltimore & Ohio Railway, which is in itself an evidence of the inroads electricity is making into the domain of the steam engine. That it will supercede the locomotive, as it has the horse car, I have no doubt, but I seriously question whether it will ever be applied in its present status to the propulsion of large vessels.

The steam locomotive, by reason of the conditions under which it has to work, is not an economical machine, and the limitations as to size and weight make it well nigh impossible to improve its economy. Electricity can be generated by multiple expansion condensing engines taking steam from efficient boilers; can suffer loss of from 10 to 15 per cent. in generation and transmission and still haul a load with less coal than with the application of steam direct. It has been lately demonstrated in France that electricity can be generated in the moter car by an efficient steam plant and still drive the locomotive more economically than can be done by the action of steam directly on the wheels. There are at present three systems by which electricity may be applied. One of these, very successful in its operation, is the trolley system, but I do not believe that, on the lakes for instance, vessel owners would favor the stringing of trolley wires overhead throughout the water courses, even for the purpose of furnishing motive power for their own ships. If we turn to the accumulator system, it is found that the accumulators must be charged from a generator driven by a steam engine or some other prime mover, and as modern accumulator batteries go, one having sufficient power to propel a vessel carrying 1,500 tons of coal to Lake Superior would sink the largest craft afloat on the lakes.

The scheme of generating the electricity aboard and then using it through motors on the propeller shaft to drive the vessel is a possible one, but where is the advantage? Unlike the steam locomotive, the vessel offers no obstacle to the attainment of the highest possible steam engine economy. The important factor in engine efficiency, constancy of load, is here present in perfection, and while some mill engines in England have obtained a horse power on 1.39 pounds of coal, there is no law which says marine engines shall not do as well. Over there, investments must earn 2 per cent; here it must be three times 2 per cent, and this probably accounts for the difference between a horse power for 1.39 pounds of coal and a horse power for 1.89 pounds of coal, the latter being the best authentic record taken from a lake vessel under ordinary, every-day conditions. It is hardly possible that 10 per cent. more will be added to this in order that our ships may be driven by electricity. Although electrical engineers repudiate with emphasis that electricity is in its infancy, we can see the possibility of the generation of electricity direct from coal, without the interruption of the steam boiler and engine, and when that point is reached we can figure on the size of motors necessary to drive our boats. In the meantime we will try and get along with the steam engine and its accompanying expenditures.

GEO. C. SHEPARD.

Cleveland, O., August 6, 1895.

In General.

The Manitoba wheat crop is officially estimated at 30,000,000 bushels, or about one-third over that of last year.

John Parker, who has been connected with the Detroit Dry Dock Co. for a great number of years, has been seriously sick of late.

Two hundred dollars is allowed by the British admiralty for the expense of launching a battleship. The expense is nearly ten times that, the remainder being charged to construction.

Friends of Col. Wm. Ludlow, engineer corps, U. S. A., will be interested in the announcement that he is now in reality a lieutenant colonel. He was advanced in rank a few days ago.

Washington dispatches report that the Herreshoffs have made an offer to Secretary Herbert to build for $150,000 a torpedo boat capable of attaining a speed of 27½ knots an hour.

The Italian government has ordered the construction of a new submarine boat of the Delfino type. She will be 50 feet long and 11 feet 4 inches broad, and she is to have an under water speed of 10 knots.

Captains of the steamers of the Flint & Pere Marquette line have been changed around. Steamer No. 5 has been laid up and her captain, John Gee, has been placed in command of No. 1, Capt. Nolan taking No. 2, Capt. Joseph Russell No. 3 and John J Doyle No. 4.

France will also build triple screw cruisers. Since the meeting of naval architects in Paris it has been announced that the government will put down two ships of this type, but they will be of only 8,500 tons displacement each.

Sumner I. Kimball, general superintendent of the United States life saving service, has just completed a trip of inspection among Michigan stations. He also visited the Wyandotte Boat Works and the works of the Wolverine Dry Dock Co., Port Huron, where a large number of life boats are being built for the service.

Pig iron production is still increasing. Figures prepared on August 1 show that the furnaces are still pushing things even to a greater degree than they were a month ago. Comparing the report at the opening of August with that of July an increase of 11,626 tons in weekly production is found. During July there were 187 furnaces in blast with a weekly capacity of 164,879 tons of pig iron; the August report shows 203 furnaces with a weekly capacity of 176,505 tons.

Dispatch in the ore and coal trade at Ohio ports is fast approaching the records of grain elevators and hard coal chutes at Buffalo. At Ashtabula on Monday morning last, work was begun on the steamer Kearsarge, which had arrived at the Minnesota docks with 2,750 gross tons of ore. The ore was taken out and 2,428 net tons of coal dumped into the steamer by the McMyler car dumping machine, all in one day, giving her time to put on about 200 tons of fuel and leave on another trip at midnight.

Trade Notes.

Fred H. Pell of the Marine Manufacturing and Supply Co., New York, is making a trip among lake ship chandlers and ship builders.

The two Roberts safety water tube boilers, which will be placed in the McElroy steamer Unique, are to be completed and shipped to the lakes by October 1. They are of the same size as the boilers of other makes which were tried in the boat and taken out. They are being built to suit the space in the boat, and are expected to furnish 1,000 horse power to the quadruple expansion engines of the Unique.

The Geo. F. Blake Mnfg. Co., Liberty street, New York, has published the report of Past Assistant Engineer Albert B. Willitts, U. S. N., of the contract trial of the United States triple-screw armored cruiser Minneapolis. It is a pamphlet of twenty pages, containing a detailed description of the vessel and trial, with the reproduction of the indicator diagrams, etc., and is sent free on application.

Death of John R. Irwin.

The announcement on Monday last of the death of J. R. Irwin created surprise throughout the lakes, but friends in Cleveland and at his home had known of his failing health for several months past. Since Fairport has been known as a shipping point on the lakes the name of J. R. Irwin has been as familiar as the place itself. He was the moving spirit in all its affairs. He was a man of great stature, striking in appearance, and in business matters he possessed all the command that his appearance implied, but liberality and a large heart were features of his personal character well known to all who were favored by an acquaintance with him, aside from his practical business dealings.

John R. Irwin was forty-nine years of age. He was born near Livermore, Pa., August 17, 1846. At sixteen he enlisted as a soldier. Upon his return from the army he began work as a railroad brakeman. His promotions to conductor, engineer, dispatcher, yard master, train master and superintendent followed each other rapidly, and in July, 1886, he

left Newark, O., where he had charge of a division of the B. & O. railway to take up at Painesville the rebuilding of the narrow gauge P. & W railway into standard gauge. This work he accomplished within six weeks and was shortly thereafter appointed manager of the various docks at Fairport. At the time of his death he was manager for the Pennsylvania & Lake Erie Dock Co., the Pittsburg, Fairport & Northwestern Dock Co. and the American Transportation Co. He had other interests also in and around Fairport and was mayor of Painesville. His interests in the American Transportation Co. gave him control of the steamers Harper and Nimick and the steel schooner Tyrone, just built by the Globe Iron Works Co., Cleveland. Mr. Irwin was also president of the Euclid Beach Park Co., a corporation that has built up recently a popular excursion resort on the lake shore just east of Cleveland The funeral on Tuesday was attended by a large number of marine and railway men, by city officials of Painesville, by members of the Masonic order and by a company of the Ohio National Guard.

Detroit River Channels.

Treasurer George P. McKay of the Lake Carriers' Association spent a couple of days of last week on the Detroit river in the vicinity of Ballard's Reef and the Lime-Kiln crossing, and as a result of his visit to that locatity, lights have been placed by Captain Andrew Hacket on Boston and New York shoals,below the Lime-Kiln cut. On the New York shoal there is one red light and on the Boston shoal a white light with a red light above it. These spots are marked by buoys, but it was understood that in passing at night there was frequent crowding of vessels and great danger of stranding. By going to Amherstburg and Bois Blanc island, and observing the passage of vessels by night, Capt. McKay found this to be the case and accordingly ordered the float lights.

Vessel masters will be interested in knowing that with the exception of two spots in the stretch from Ballard's reef to the Lime-Kiln cut, for 300 feet west of the Overman or Grosse isle ranges, there is a channel of 17 feet. It must be noted, however, that this channel is west of the range where the dredging has been going on. The two shoal points are now marked by buoys. On the port hand going up is a black buoy marking a boulder that has only 16 feet over it at normal stage of water, and on the starboard hand, about 1,200 to 1,500 feet below Ballard's reef light, is a red stake marking a dangerous cluster of rocks, which can not be removed as yet. This cluster has but 16 feet of water over it at normal stage and vessel masters should go very slow and use great care in passing.

Capt. McKay requests newspapers in lake cities to give publicity to this information for the benefit of all vessels.

Tows or No Tows.

The announcement that the Chicago Ship Building Co. has closed a contract for a third steel schooner, similar to the two to be built for the Minnesota Steamship Co., again directs attention to tows in the lake trade. This third boat is for the North Western Transportation Co., in which Capt. E. M. Peck of Detroit and Harvey H. Brown of Cleveland are interested. The boat may be towed by the S. R. Kirby or Harvey H. Brown, and possibly on some occasions by the Castalia. Now that the pace has been set for steel tow barges, it would not be surprising to hear of more orders for boats of this kind shortly, as the Cleveland-Cliffs Iron Co. and two or three individual owners are known to have been figuring in this direction.

It is true that Pickands, Mather & Co., who are being followed in this matter, have thus far this season managed to keep together all of the whaleback tows, as well as the tows made up through chartered steamers from Messrs. Bradley, Mitchell and others. There has been no shifting of barges, as was the case with the whalebacks last season, and some of "pig" tows, as they are commonly called, are now on a twelfth trip. This is wonderful work, but in the whole question of tows or no tows it must be remembered that Pickands, Mather & Co. control docks and they can make arrangements for dispatch in cases where outsiders would not be considered and under circumstances that would otherise make towing unprofitable.

Steel Forgings.

Everything in the way of forgings in the new revenue cutter under contract at the works of the Globe company, Cleveland, will be furnished by the Bethlehem Iron Company of South Bethlehem, Pa, The order includes shaft work, cranks, crank webs, connecting rods, valve stems, etc., and will involve about 40,000 pounds of forgings. Steel forgings are a part of the higher practice of the navy in marine engineering, and are, of course, more costly than wrought iron. This is the first instance in which these forgings are to be used on the lakes, and it is the entering wedge for the Bethlehem company, which has furnished forgings for nearly all the ships of the navy and a large number of merchant ships on the coast. The order, by means of which the Bethlehem company will have an opportunity to demonstrate the superiority of its product in this line, was secured through the untiring efforts of Mr. Fisher of Fisher & Porter, western agents for the Bethlehem concern. For several months past Mr. Fisher, who was engaged in business in Cleveland for a number of years, and who is well acquainted with lake ship builders, has been constantly laboring to introduce steel forgings in a lake vessel. Higher cost, on account of the superior material, has been a drawback in the work, but it is expected that this order will open the way for more steel forgings in cases where the best material is demanded.

A Dangerous Shoal.

Capt. J. D. Peterson of the steamer J. C. Lockwood, who is one of the most reliable masters on the lakes, reports that on Monday last, while bound to Cleveland with ore and drawing only 14 feet, his boat struck a shoal or wreck in Lake Erie, S. E. by S. 5¼ miles from Pelee point light-house. The Lockwood was going at full speed and struck so heavy that she came near stopping. Capt. Peterson is of the opinion that the obstruction is a sunken wreck. It is certainly a dangerous spot and should be marked, as no vessel master would look for less than 75 feet of water in the vicinity. Capt. Peterson feels certain of his report of the location of the spot, as he swung the stern of his vessel onto the light-house, in order to make a correct report regarding the obstruction.

In summing up an article relative to the ownership of lands and royalties on the Mesabi iron range, the Iron age of New York says "Enough has been said to show that the owners of Mesabi lands are sure of immense fortunes from the development by other men of the gifts which nature hid away in Northern Minnesota soil, and which they were fortunate enough to unwittingly secure. That these amounts will reach a total of $50,000,000 or more in the time that lapses before the ore of the Mesabi is exhausted is not at all beyond the range of the prospects as they exist today. There is no little lesson in all this for him who believes in the public control of the unearned increment."

Fore and Aft Vibration.

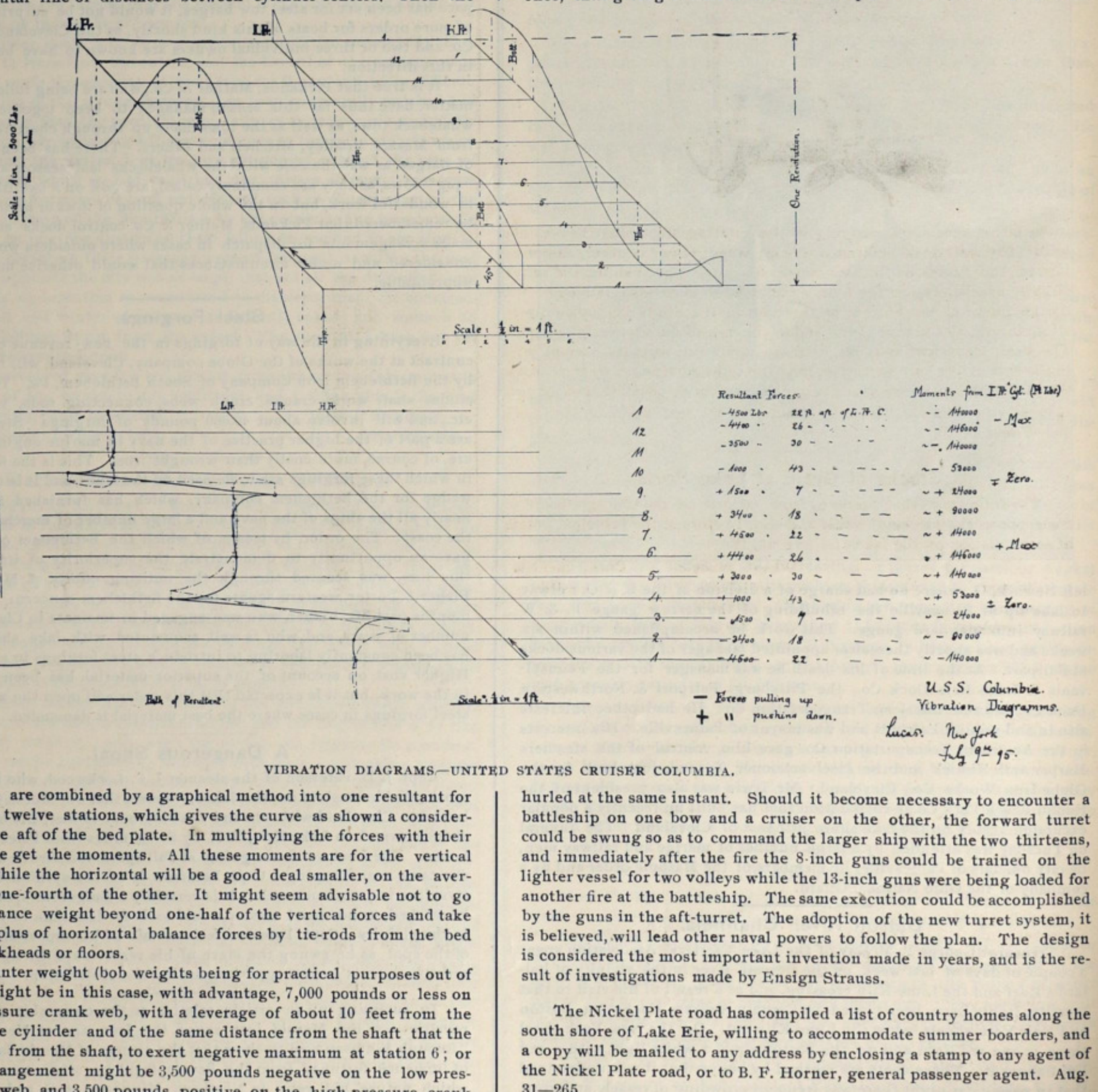
Editor MARINE REVIEW: With a constant increase in the power of engines and lightness of hull necessary to reach the desired high speed of modern naval and mercantile steamers, vibration often shows itself in a most unpleasant way, and it is not easy to determine what means to take for counteracting factors that produce the oscillations. The accompanying diagram was prepared with a view to obtaining some light on the question of the fore and aft rocking oscillation, as the most objectionable form of vibration, the others being comparatively less important and more easily overcome by braces and tie-rods.

It was intended to find for twelve equal parts of one revolution the resultant of the vertical components of the inertia forces in regard to position, magnitude and direction. The example chosen is one engine of the United States cruiser Columbia. The inertia forces of the valves are left out of consideration, as being comparatively small in magnitude and well distributed all over the bed plate. Neither is the angularity of the connecting rods taken into account, as they do not influence the positions of maximum and minimum to any great extent.

As seen by the engraving the inertia forces of each cylinder are set off similar to a metacentric diagram, from a base line 45° inclined against the horizontal line of distances between cylinder centers. Then the three forces are combined by a graphical method into one resultant for each of the twelve stations, which gives the curve as shown a considerable distance aft of the bed plate. In multiplying the forces with their distances we get the moments. All these moments are for the vertical vibration, while the horizontal will be a good deal smaller, on the average about one-fourth of the other. It might seem advisable not to go into the balance weight beyond one-half of the vertical forces and take up the surplus of horizontal balance forces by tie-rods from the bed plate to bulkheads or floors.

The counter weight (bob weights being for practical purposes out of question) might be in this case, with advantage, 7,000 pounds or less on the low pressure crank web, with a leverage of about 10 feet from the intermediate cylinder and of the same distance from the shaft that the crank pin is from the shaft, to exert negative maximum at station 6; or another arrangement might be 3,500 pounds negative on the low pressure crank web and 3,500 pounds positive on the high pressure crank web. Through such an analysis and application of balance weights many a triple or compound engine could be considerably benefitted, wear and tear reduced, passengers made more comfortable, etc.

No. 1 Broadway, New York, Aug. 14, 1895. THEODORE LUCAS.


L.Pr.
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Scale: 1 in. = 5000 Lbs
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Scale: ½ in. = 1 ft.
Resultant Forces
Moments from I.P. Cyl. (ft lbs)
1 -4500 Lbs 22 ft. aft of I.P. C. -146000 - Max
12 -4400 " 26 " " " " -146000
11 -3500 " 30 " " " " -146000
10 -1000 " 43 " " " " -53000 ± Zero.
9 +1500 " 7 " " " " +24000
8 +3400 " 18 " " " " +90000
7 +4500 " 22 " " " " +146000
6 +4400 " 26 " " " " +146000 + Max
5 +3000 " 30 " " " " +146000
4 +1000 " 43 " " " " +53000 ± Zero.
3 -1500 " 7 " " " " -24000
2 -3400 " 18 " " " " -90000
1 -4600 " 22 " " " " -146000
Belt of Resultant.
Scale: ½ in. = 1 ft.
— Forces pulling up
+ " pushing down.
U.S.S. Columbia.
Vibration Diagramms.
Lucas. New York
July 9th 95.

VIBRATION DIAGRAMS—UNITED STATES CRUISER COLUMBIA.

The New Battleships.

The two battleships for which appropriations were provided by the last congress are now practically decided upon in every particular, except the weight of the machinery. The present plan contemplates a weight of 1,200 tons, while the secretary of the navy is anxious to reduce it to 1,000 in order to prevent a greater draught than 25 feet maximum. The principal dimensions are: Length on water line, 368 feet; beam, 72 feet; maximum depth, 25 feet; displacement, about 11,500 tons, and a speed of 16 knots in the open seas. The armament will consist of four 13-inch rifles, mounted in two turrets, fore and aft, and four 8-inch rifles, mounted over the 13-inch guns. The secondary battery will comprise sixteen 5-inch rapid-fire guns. Machine guns will be mounted in two military masts and at convenient places about the superstructure. The new ships will have in the so called double-deck turrets the first real departure in the methods of installing guns on war ships. These turrets are practically one structure, with a second story, the 13-inch guns being mounted on the first floor, and the eights above. The advantage claimed for them is concentration of fire and reduced weights in the turrets, while the 8-inch guns will have the same protection as the heavier ones. The four guns of the turret, it is claimed, can be fired at once, thus giving a terrific blow to a ship struck by four projectiles hurled at the same instant. Should it become necessary to encounter a battleship on one bow and a cruiser on the other, the forward turret could be swung so as to command the larger ship with the two thirteens, and immediately after the fire the 8-inch guns could be trained on the lighter vessel for two volleys while the 13-inch guns were being loaded for another fire at the battleship. The same execution could be accomplished by the guns in the aft-turret. The adoption of the new turret system, it is believed, will lead other naval powers to follow the plan. The design is considered the most important invention made in years, and is the result of investigations made by Ensign Strauss.

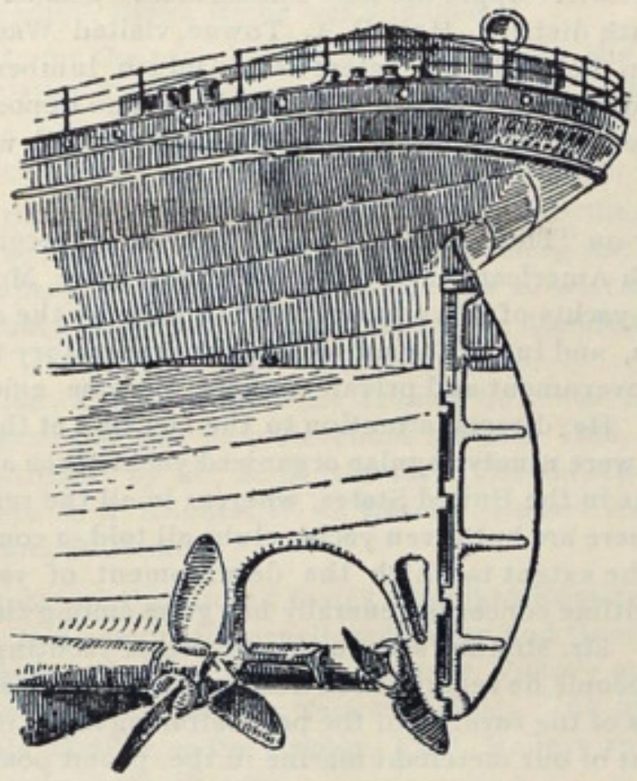
The Nickel Plate road has compiled a list of country homes along the south shore of Lake Erie, willing to accommodate summer boarders, and a copy will be mailed to any address by enclosing a stamp to any agent of the Nickel Plate road, or to B. F. Horner, general passenger agent. Aug. 31—265

$3.00 to Niagara Falls via Nickel Plate road, Aug. 19th. Train leaves Cleveland 10:00 p. m. 331

ALL NEW HYDROGRAPHIC CHARTS ARE KEPT IN STOCK BY THE MARINE REVIEW, 516 PERRY-PAYNE BUILDING, CLEVELAND.

Novel Arrangement of Twin Screws.

A novel and peculiar arrangement of screws is shown in the accompanying sketch, which represents the stern of the White Star liner Georgie, the largest cargo steamer in the world. The dead weight capacity of this vessel is 14,000 tons, and she is fitted with twin-screw triple-expansion engines of the four-cylinder type. She was launched recently by Harland & Wolff, the famous Belfast builders. The stern arrangement introduced by these builders in the earlier twin-screw boats which they built for the White Star line, and adopted by the Fairfield Ship Building Co. in the Lucania and Campania, is followed in this boat



in so far as affects the carrying of the shafting aft inside the vessel's hull. The method of making one shaft longer than the other, and of allowing the blades of the two screws to work one behind the other, slightly overlapping in the hole in the deadwood, is also retained. But the heelpiece at the bottom of the hole in the deadwood is cut away altogether, and the base of the rudder is carried on a powerful bracket. The keel, too, is cut away aft, sloping rapidly up from its normal level in the rest of the ship to the level of the screw shafting. By this means the play of the screws is given as much freedom as possible, and turning is greatly facilitated. This big steamer is 557 feet keel, 60 feet beam and 40 feet depth.

Stocks of Grain at Lake Ports.

The following table, prepared from reports of the Chicago board of trade, shows the stocks of wheat and corn in store at the principal points of accumulation on the lakes on Aug. 10, 1895 :

	Wheat, bushels.	Corn, bushels.
Chicago	15,373,000	1,335,000
Duluth	5,812,000	.....
Milwaukee	243,000	.....
Detroit	241,000	86,000
Toledo	1,162,000	153,000
Buffalo	1,193,000	252,000
Total	24,024,000	1,826,000

As compared with a week ago, the above figures show at the several points named a decrease of 631,000 bushels of wheat and 423,000 bushels of corn.

Chief Engineer James H. Perry and Past Assistant Engineer H. P. Norton are the officers from the bureau of engineering, navy department, selected to witness and report upon the operation of Belleville boilers in the Northern line passenger steamer North West. While this examination of these boilers is being made by the navy, Chief Engineer Fraser of the Northern line will also be engaged in similar work on the steamers, and will be assisted by Geo. C. Shepard of Cleveland, and probably two or three other experts from Cornell university.

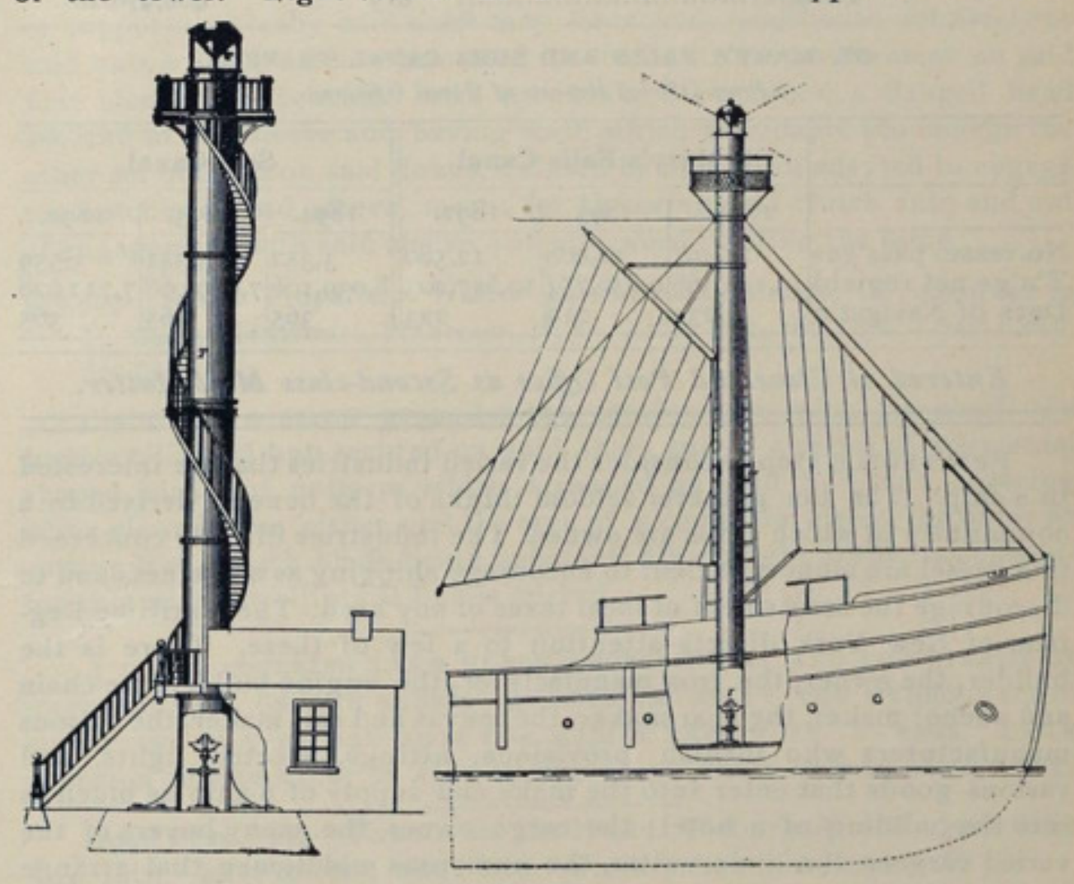
In answer to inquiry from Mayor Swift of Chicago, the trustees of the Chicago drainage canal say that the main channel will be completed in the fall of 1897. Nearly 60 per cent. of the work has been done, and several sections of the canal will be entirely completed in a few months.

THREE BOOKS OF SAILING DIRECTIONS, ONE COVERING LAKE SUPERIOR AND THE ST. MARY'S RIVER, ANOTHER COVERING LAKE MICHIGAN AND THE STRAITS OF MACKINAC, AND A THIRD TAKING IN LAKES HURON AND ST. CLAIR WITH DETROIT AND ST. CLAIR RIVERS, ARE NOW OFFERED FOR SALE BY THE HYDROGRAPHIC OFFICE. THESE BOOKS ARE PARTS OF A WORK THAT WILL COVER THE ENTIRE CHAIN OF LAKES. THEY CONTAIN CHARTS OF LEADING CHANNELS AND HARBORS, AND MAY BE HAD FROM THE MARINE REVIEW, 516 PERRY-PAYNE BUILDING, CLEVELAND, AT $1 EACH.

New Method of Operating Light-Houses.

David Porter Heap, a member of the army engineer corps who has attained quite a reputation for special work in the light-house service, has just secured letters patent on an arrangement of illuminating apparatus within light stations or the towers of light ships, by means of which he proposes to operate the light from the base of the light station or light tower on the ship. It is claimed by the inventor that there are many disadvantages in operating lights in light-houses and light vessels under the present system of locating all of the apparatus in the upper part of the tower, and his invention provides for operating the light at or near the base of the tower, while its displayed beams are deflected from a reflector sustained at such elevation as to produce an increased effect. The engraving shows a light-house and light-ship embodying the invention. In reviewing disadvantages of the present system and directing attention to his improvements the inventor says:

"Light-houses as ordinarily constructed require a tower of considerable height for the display of the signal, which tower must not only be equal to the support of a costly and weighty lantern, an illuminating apparatus and its accessories located near its upper end, but in order to capacitate it to maintain such a heavy load at its top at all times it must additionally be strong enough to resist the action of storms. Such a lantern, illuminating apparatus, and accessories weigh about three tons in light houses of the fourth, fifth, and sixth orders, and in the higher orders these parts are proportionately heavier. This weight and bulk at the top of the tower and other conditions necessitate an extensive, strong, and, consequently, expensive structure, and the location of the illuminating apparatus at the top of the tower entails a costly maintenance. That the cost of such towers will be largely reduced if they can be relieved of the heavy weights which they now carry at their tops is apparent, since they will then only have to be constructed sufficiently strong to resist damage from storms, and the difficulty and expense of attending and maintaining the illuminating apparatus will be greatly reduced by concentrating the illuminating machinery at the base of the tower. Light-vessels as now built are supplied with two



lanterns, which are each displayed form special masts provided in addition to the sail masts. These lanterns are each furnished with eight lamps and require to be made very strong and consequently very heavy, each weighing about one ton. They are provided with a hoisting apparatus for raising them at night to a height determined by the attachment of the stays for their carrying masts, so that the light is exhibited at a point about 40 feet above the vessel's deck, which elevation gives it a limited range. These lanterns require to be lowered into houses at the base of their masts for trimming, etc., and when raised their heavy weight near the tops of the special masts necessarily causes the vessel to roll unduly, thus tending to constantly vary the direction of the emergent beams of light, which defective action is partially overcome by hanging the lamps on gimbals. Their lights are not visible from the deck, and should any one be extinguished or defectively burn the fault is not readily discernible, and if apparent the entire lantern must be lowered to the deck to correct it, an operation requiring time, during which the light from the lantern would not be shown, and which lowering and rehoisting is a difficult operation, especially during a storm, when the light is most liable to become defective. The cost of a lighting apparatus of a light-vessel will therefore be greatly reduced, the existence of a heavy weight near the tops of the masts and the resulting bad effects due to the excessive rolling be avoided, the hoisting devices become unnecessary, etc., by concentrating the illuminating machinery at the base of a tubular mast."

MARINE REVIEW

DEVOTED TO THE LAKE MARINE AND KINDRED INTERESTS.

Published every Thursday at No. 516 Perry-Payne building, Cleveland, O

SUBSCRIPTION—$2.00 per year in advance. Single copies 10 cents each. Convenient binders sent, post paid, 75 cents. Advertising rates on application.

The books of the United States treasury department contain the names of 3,341 vessels, of 1,227,400.72 gross tons register in the lake trade. The number of steam vessels of 1,000 gross tons and over that amount on the lakes on June 30, 1894, was 359 and their aggregate gross tonnage 634,467.84; the number of vessels of this class owned in all other parts of the country on the same date was 316 and their tonnage 642,642.50, so that half of the best steamships in all the United States are owned on the lakes. The classification of the entire lake fleet on June 30, 1894, was as follows:

Class.	Number.	Gross Tonnage.
Steam vessels	1,731	843,239.65
Sailing vessels	1,139	302,985.31
Canal boats	386	41,961.25
Barges	85	39,214.51
Total	3,341	1,227,400.72

The gross registered tonnage of vessels built on the lakes during the past five years, according to the reports of the United States commissioner of navigation, is as follows:

	Number.	Net Tonnage.
Year ending June 30, 1890	218	108,515.00
" " " 1891	204	111,856.45
" " " 1892	169	45,168.98
" " " 1893	175	99,271.24
" " " 1894	106	41,984.61
Total	872	406,976.28

ST. MARY'S FALLS AND SUEZ CANAL TRAFFIC.

(From Official Reports of Canal Officers.)

	St. Mary's Falls Canal.			SuezCanal.		
	1894.	1893.	1892.	1894.	1893.	1892.
No. vessel pass'ges	14,491	12,008	12,580	3,352	3,341	3,559
T'n'ge, net registd	13,110,366	9,849,754	10,647,203	8,039,106	7,659,068	7,712,028
Days of Navigat'n	234	219	223	365	365	365

Entered at Cleveland Post Office as Second-class Mail Matter.

FEW PEOPLE stop to consider the varied industries that are interested in a ship. The tax gatherer seldom thinks of the benefits derived by a community in which ships are owned. The industries directly concerned in a vessel are alone sufficient to encourage shipping as a business and to discourage the assessment of local taxes of any kind. The Maritime Register of New York directs attention to a few of these. There is the builder, the owner, the iron manufacturer, the engine builder, the chain and anchor maker, the spar maker, the canvas and sail maker, the various manufacturers who furnish provisions, fittings, electric lights, and various goods that enter into the make and supply of a ship as much as into the building of a hotel; the cargo owner, the many buyers of the varied cargoes, the underwriter, the numerous middlemen that arrange for everything in the supply, employment and management of the ship and in the buying and sale of her cargo; the warehousemen, the crew, the men who live on the crew, the tugs, and the wharfinger. There are many trades besides these, directly engaged and depending almost entirely upon the ship for support. There are also to be added those trades that supply goods to and are but ramifications of those directly concerned in the making and running of the ship itself. Indeed, when the list is considered as a whole, it may be claimed that no single industry is as important as shipping in the variety of trades that it practically creates and supports, or as valuable to a country in its influence upon the general business and commercial welfare of a country. It needs no other argument, therefore, to support the assertion, that it is of the very greatest necessity and of immense advantage for this country to be a ship owner.

IT IS of course expected that any bill for the regulation of raft towing on the lakes, introduced in the next congress, will have reference to the towing of rafts in the harbors of Duluth and Superior as well as the connecting channels between Lake Superior and Lake Erie. It would seem, therefore, that officers of the Lake Carriers' Association having this matter in charge will do well to anticipate and conciliate, if possible, such opposition as may come from the lumber interests at the head of the lakes. That some opposition may be expected from this source seems quite probable from the following paragraph contained in a recent number of one of the lumber journals: "The lake carriers, it is said, will again bring the bill to prohibit raft towing in harbors, or at least to greatly cut it down, before congress this year. It failed in the last congress, as it ought to have failed, because it was unjust to lumbermen, and, in a harbor like Duluth would have been a most severe blow to the lumber interests, and incidentally, to the vessel interests too. The hardest fighter against the measure, Senator Washburn of Minnesota, will not be in the senate to work against it, but his successor will undoubtedly join with Senator McMillan and other senators, and those members of the house who look after lumber interests as well as other interests, in fighting any measure which will cripple the lake lumbermen. The new congressman from the Duluth district, Hon. C. A. Towne, visited Washington when the bill was up before in the interests of Duluth lumbermen and thoroughly understands the measure and will be found opposing it. It is a safe prediction that no such bill as was before pushed will get through congress."

IN A paper on "The Yacht as a Naval Auxiliary," recently contributed to the North American Review, Assistant Secretary McAdoo suggests that the steam yachts of this country may, in part by the adaption of the existing types, and in part by an agreement preparatory to construction between the government and private owners, become efficient auxiliary naval vessels. He directs attention to the fact that at the beginning of the year there were ninety regular organized yacht clubs and four auxiliary associations in the United States, whereas in all the remainder of this hemisphere there are but seven yacht clubs all told, a comparison which goes to show the extent to which the development of yachting and of interest in maritime concerns generally has gone among the people of the United States. Mr. McAdoo sees in the growth of yachting in the United States, whose people he regards as at heart a maritime people, but one of the many signs of the turning of the population again to the sea, and the reestablishment of our merchant marine in the proud position it held in the days of the famous clipper ships.

IT is safe to conclude that Capt. Alex. McDougall did not miss the opportunity, in his talk with Secretary Carlisle aboard the light-house steamer Amaranth, to direct the attention of the secretary to the necessity of hurrying work on the new lock at Sault Ste. Marie. Capt. McDougall is of the opinion that this work is not being pushed as rapidly as it might be, and with all due respect to Gen. Poe it may be said that there are other vessel owners who agree with Capt. McDougall, that the time has arrived for taking extreme measures toward the early completion of the lock and approaches.

A SCARCITY of labor in the Lake Superior mining region may yet be the cause of less ore being brought down this season than would be shipped if miners were plentiful. A large number of men are leaving the mining districts, some going to far off gold and silver producing regions, some to the west and great numbers to the harvest fields.

Changes Among the Engine Builders.

Circumstances have combined to produce a general change in the constructing engineers of the engine building concerns of the lakes. The latest information is to the effect that Geo. A. Mattsson, who for twelve years has been with S. F. Hodge & Co., has accepted a position with the Dry Dock Engine Works, C. B. Calder retaining, as heretofore, the position of superintending engineer, but devoting more time to outside work. There is probably no other position on the lakes that would tempt Mr. Mattsson to leave Hodge & Co., but his friendly relations with Mr. Calder for years, and the fact that his work before coming to the lakes has always been with concerns that built steamers complete, together with the very excellent offer made to him, have all combined to bring about the change. Mr. Mattsson does not take his new place until Sept. 1, as he had some important work that he wished to complete before leaving, and it was his desire to finish up with his present employers all work on hand.

As noted a week ago, Mr. Henry Penton takes the position at Hodge & Co's. thus made vacant. There is no one on the lakes more capable of filling the place satisfactorily, for in his position with the Frontier Iron works Mr. Penton has designed and constructed the same class of machinery that Hodge & Co. have been building for some time past. The majority of engines for the Davidson boats were designed by him, and his work may be compared with the best that there is to be found in this part of the country. William L. E. Mahon, the gentleman who takes Mr. Penton's place in the Frontier Iron Works, is best known through his connection with the American Steel Barge Co. as superintending engineer for several seasons.

With Mr. Walter Miller's retirement from the Globe Iron Works Co., and Mr. Cowles advent there, there will be some new blood in lake engineering. Altogether four of the largest lake engine building concerns will have new men to decide about proportions of cylinders, length of stroke and other little details that make the wheels go round at the sterns of lake steamers.

Around the Lakes.

Ore shipments from Ashland up to and including Aug. 4, aggregated 1,340,340 gross tons, of which 642,827 tons was from the Wisconsin Central docks and 697,513 tons from the North Western docks.

The Davidson steamers Sacramento and Rappahannock and the schooner Granada have been entered in the United States Standard Register of Shipping, New York, with the highest class for wooden vessels.

Second Lieut. J. B. Cavanaugh, corps of engineers, from Willett's Point, N. Y., has been ordered by the secretary of war to report for duty at Detroit under Gen. O. M. Poe. He will probably take up some part of the work upon which Lieut. Riche was engaged.

W. H. Scott, for the past five years chief clerk in the Chicago office of the Lehigh Valley Transportation Co., has resigned to accept a similar position in the general agent's office of the Santa Fe railroad, Chicago. W. J. Colley succeeds Mr. Scott in the office of the Lehigh company.

It is again reported that the Duluth, Mesabi & Northern railway will build a second ore dock at Duluth during the coming winter. The business of the company at present certainly seems to warrant such action. It is also said that a large part of the line will be double-tracked during the winter.

A corporation, known as the Yale Transit Co., has been organized for the management of the new Cleveland steamer Yale, separate from other boats controlled by Mr. R. R. Rhodes. The incorporators of the new company are R. R. Rhodes, W. C. Rhodes, Robert Wallace, John H. Bartow and Frank S. Maston.

Sinclair Stuart of the United States Standard Register of Shipping, Prof. George R. McDermott of Cornell university, and George A. Simpson, compass adjuster, were on the big steamer Victory on her first trip. They unite in saying that she is a very stiff boat. The principal officers of the Pinkands, Mather & Co. employ, Capt. Mallory and Engineer Arnold, are in charge of the Victory.

About August 15 the temporary fourth-order light, exhibited from a framework tower at Seul Choix point, Lake Michigan, will be discontinued, and there will be established a third-order fixed white light in the conical brick tower recently erected at this station, on the easterly extremity of the point. The focal plane of the new light will be 79 feet above the mean level of the lake, and the light may be seen 16¾ statute miles in clear weather, the observer's eye 15 feet above the lake. The light will be visible to vessels from all points of approach.

Three new steam vessels from the lakes were registered in the office of the United States commissioner of navigation, treasury department, during the week ending August 3. They are: Shenango No. 1, Toledo, O., 1,941.90 tons gross, 1,320.50 net, No. 116,688; Lady Jane, Grand Haven, Mich., 21.09 tons gross, 14.34 net, No. 141,394; Gypsy, Chicago, Ill., 17.53 tons gross, 14.70 net, No. 86,324. Five of the steel canal boats, built by the Globe Iron Works Co., Cleveland, for through traffic from Lake Erie ports to New York through the Erie canal were also registered. They are each of 133.19 tons gross and 125.54 net.

Detroit papers say that the idea of fore and aft screws in car ferries now used so successfully on the lakes was original with Capt. James Millen; that the practical advantages of such a boat occured to him while bucking ice outside Buffalo harbor, and that Frank E. Kirby of the Detroit Dry Dock Co. worked out from his suggestions plans of the first ice crushing ferry boat used in the straits. However this may be, it is well known that Capt. Millen has always been a close friend, both personally and in a business way, of Mr. Kirby, and in fact all the officers of the dry dock company.

Congressman White and other owners of the wooden steamer Britannic, which was sunk a few days ago in collision with the steamer Russia, and which has since been abandoned to the underwriters, paid $95,000 for her, six or seven years ago. She was insured for $65,000, which was about all she was worth at present. The owners also get about $1,300 of insurance on the boat's freight list. Capt. Geo. McLeod, representing all of the underwriters, has asked for bids on raising the boat, but it is not probable that any of the propositions made by wreckers will be acceptable to the insurance companies. It would not be surprising if they conclude to sell the wreck.

In his recent annual report, Commander Mead, who is in charge of St. Mary's river lights, recommends that the contracts next year for the care of St. Mary's river buoys require a daily patrol with a steam tug of both the old and new channel, especially Hay Lake channel, and that no buoy be allowed to remain out of its proper position longer than twenty-four hours. Another important recommendation is made in the report of Commander Dayton, who is in charge of light-house matters on Lake Michigan. He recommends, in accordance with repeated requests from vessel owners, the establishment of a light-vessel at Peshtigo shoal, Green bay, to cost $15,000, in place of the light authorized by congress at its last session, to cost $10,000. He says he doubts if $10,000 would be sufficient to build this light and that anyway a light-vessel would much better serve the purpose.

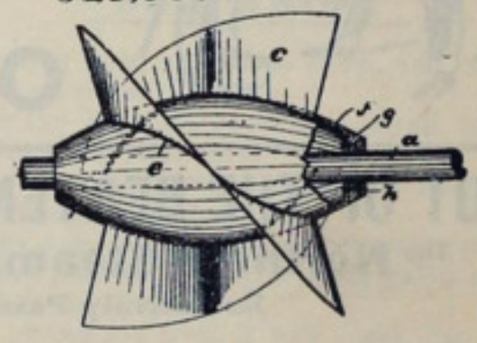
Illustrated Patent Record.

SELECTED ABSTRACTS OF SPECIFICATIONS OF A MARINE NATURE—FROM LATEST PATENT OFFICE REPORTS.

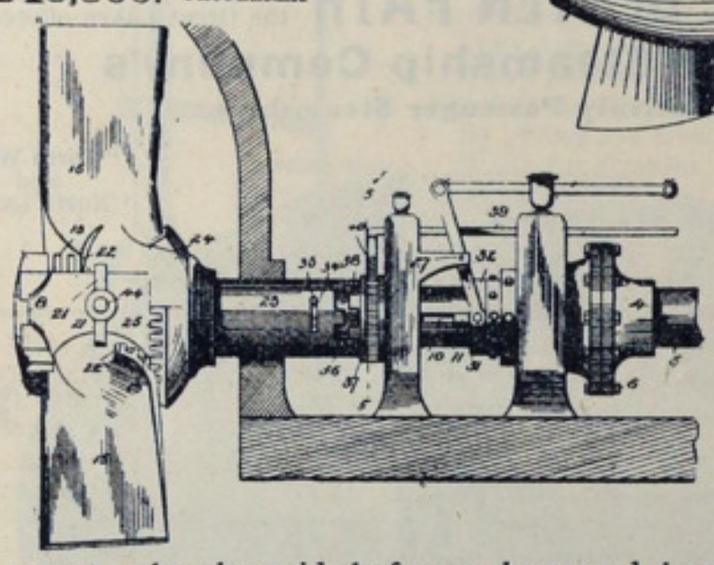
543,860. Propeller. Julius W. Flowers and Minor J. Fox, Newport, Oreg. Filed Aug. 17, 1894. Serial No. 520,647.

Claim. In a propeller, the combination with the main shaft and a toothed grab secured to one end thereof, of a hub mounted on the end of said shaft, revoluble flukes or blades rotatably mounted on the said hub having teeth on opposite sides thereof, one set of which is engaged by the toothed arms of said grab, a fixed sleeve surrounding said shaft having a longitudinal slot therein through which passes a pin secured to said shaft, a collar surrounding said sleeve and adapted to engage said pin, a lever pivoted to said collar and fulcrumed in a suitable standard

543,909. SCREW-PROPELLER



543,860. PROPELLER



or support, whereby said shaft may be moved lengthwise relatively to said hub, a second sleeve mounted for limited rotary movement on said first sleeve, and provided with notches at its rear end, a flanged head secured to said sleeve and having teeth which are adapted to engage the other set of teeth on said flukes, a clutch having teeth adapted to engage the notches in said sleeve, means for throwing said clutch into and out of engagement with said sleeve, and afterward rotating the same.

543,909. Screw Propeller. Walter Thompson, Chicago, Ill, assignor to H. Duane Hurlburt, Paterson, N. J. Filed Oct. 16, 1894. Serial No. 526,030.

Claim. In a screw propeller the combination with the shaft, of a hollow elliptical hub secured on said shaft, and of a series of segmental shaped blades of uniform width arranged on said hub, and covering when viewed from either end the area of a complete circle, the outer or cutting line of each blade being substantially straight while its connecting line with the elliptical hub is curved.

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Good Five Days—Tickets on the Nickel Plate road to Niagara Falls Aug. 19th. $3.00 for the round trip. Train leaves Cleveland 10:00 p. m.

U. S. ENGINEER OFFICE, 34 Congress St., Detroit. Mich., August 7, 1895. Sealed proposals for furnishing all labor, materials and appliances, for (A) removing shoals from west approach, St. Marys Fall's canal; (B) removing shoals from east approach, St. Mary's Fall's canal; (C) removing shoals off Six Mile Point, Hay Lake; and (D) removing shoal 29, section 4, ship channel, etc., will be received here until 2 p. m., September 6, 1895, and then publicly opened. All information furnished on application O. M. POE, Col., Engrs.,

Sept. 1.

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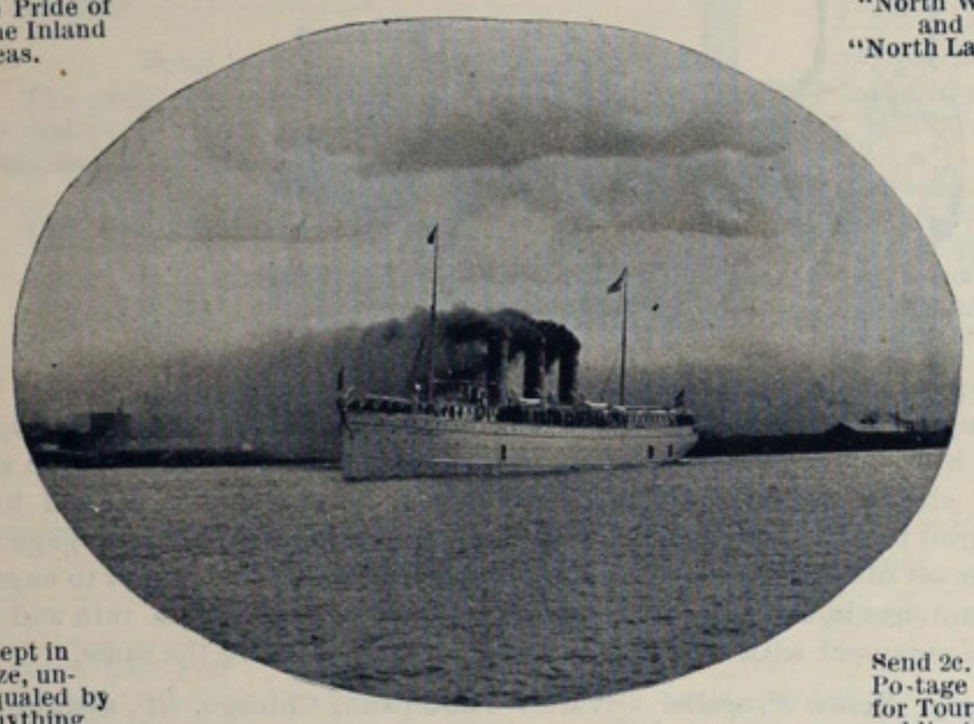

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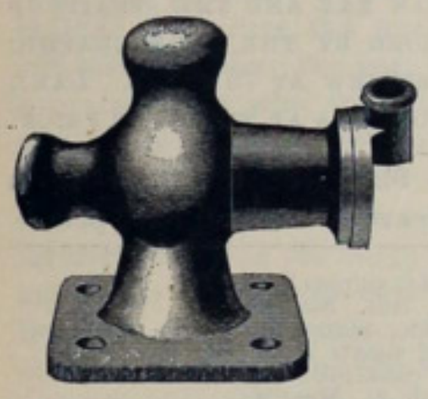

Takes the place of wooden or iron bitts and forms a Combination Bitt and Winch. Takes up less room than the ordinary bitt. Can be used to great advantage as a Windlass or Sheet Holder on Yachts. An examination will convince you of the many uses to which it can be put.

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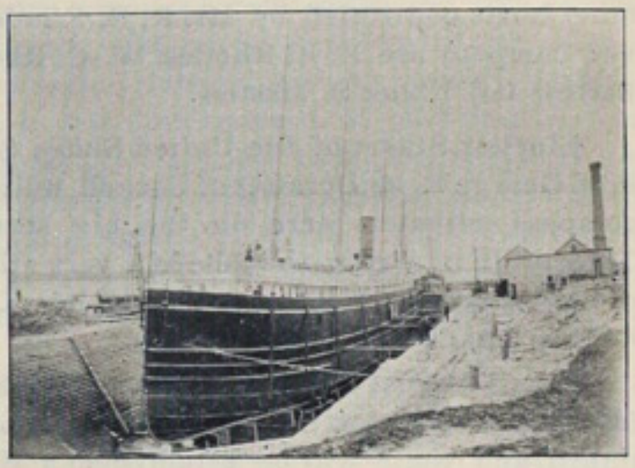
Length, 400 feet,
Width:
On top, 95 feet,
Bottom, 55 "
Gate, 62 "
Depth:
To Floor, 20 ft.
To Sill, 18 ft.
On Blocks, 16 ft.



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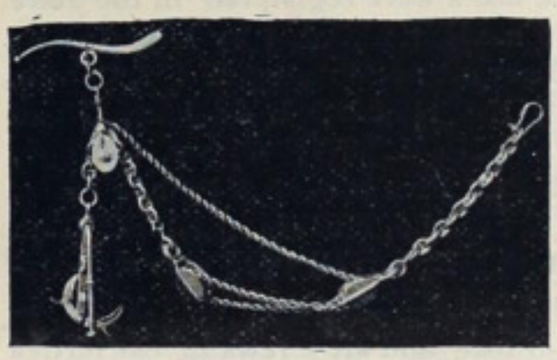

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No Car Boats, Ferry Boats or Elevators in the way.
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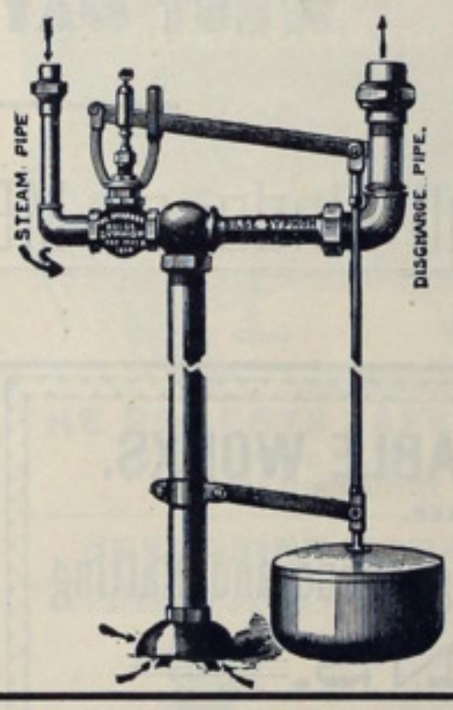

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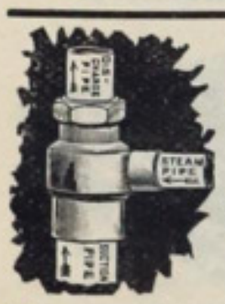

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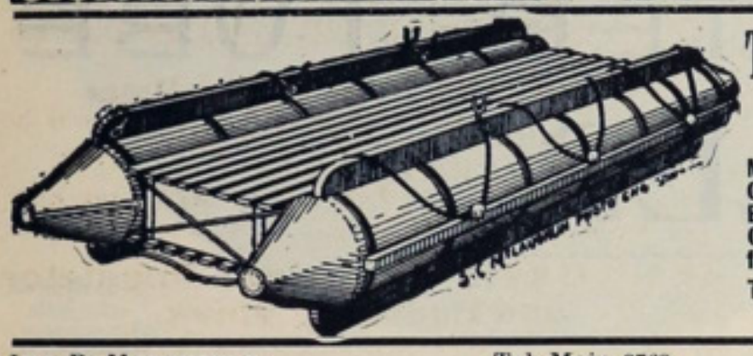

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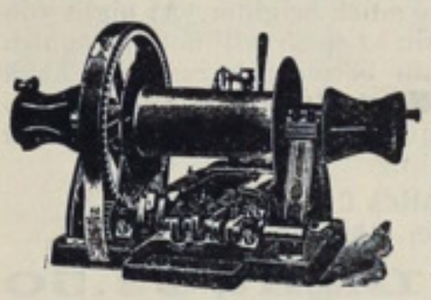

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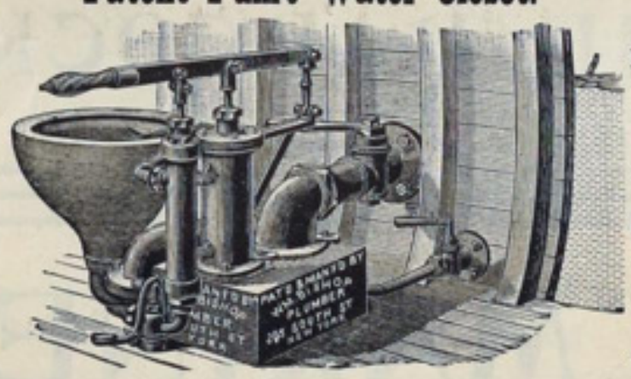

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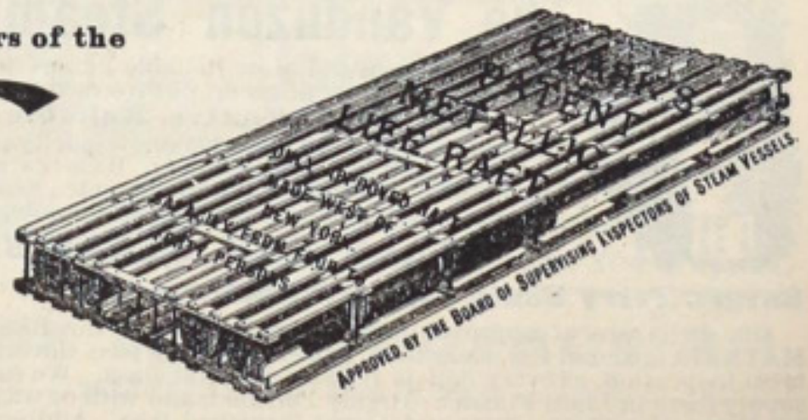

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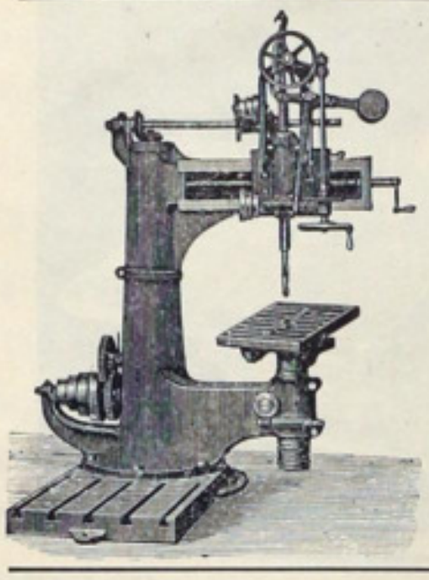

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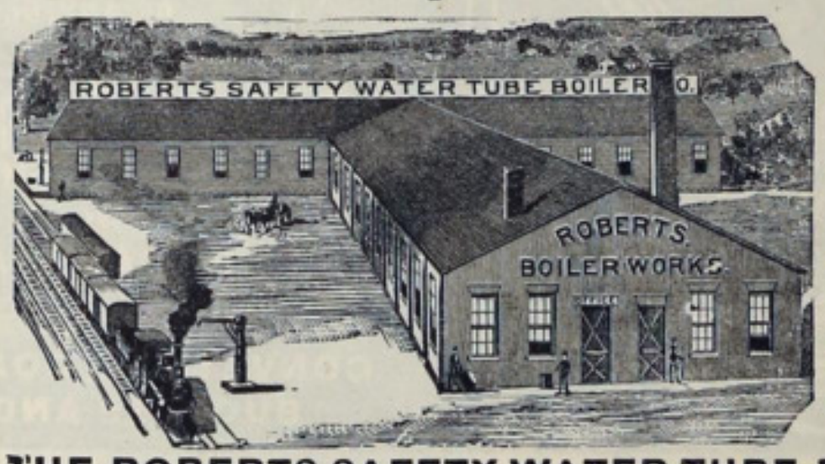

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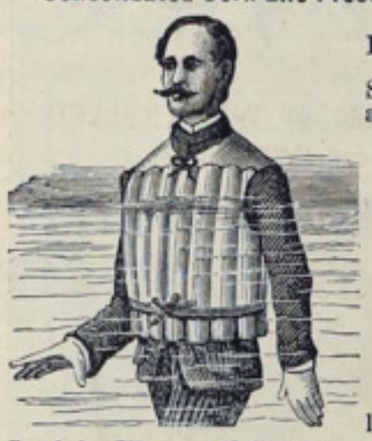

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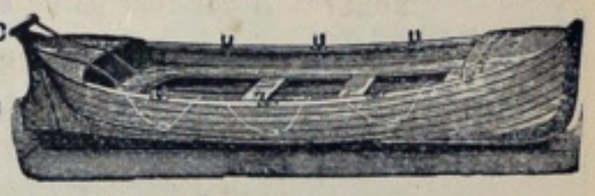

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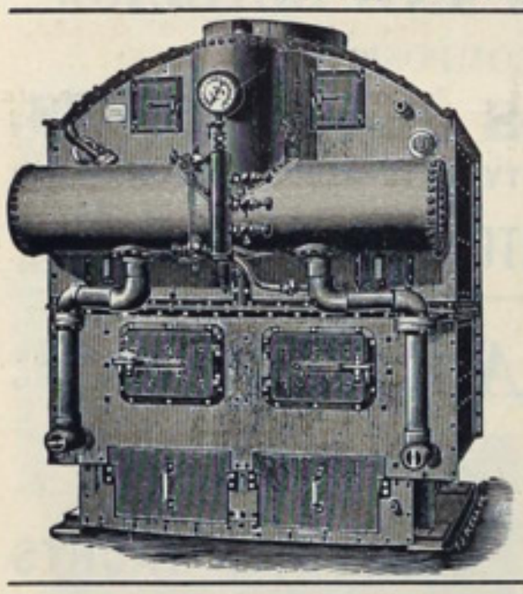

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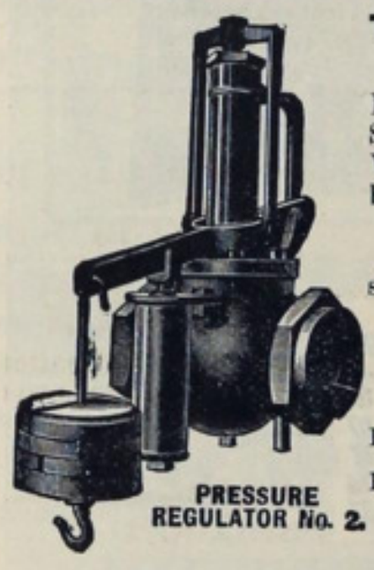

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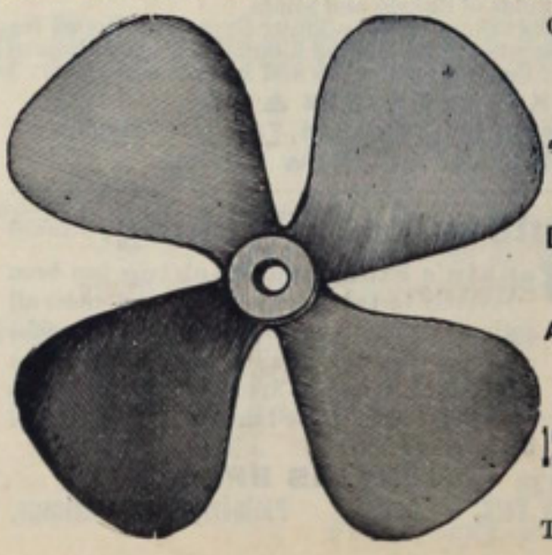

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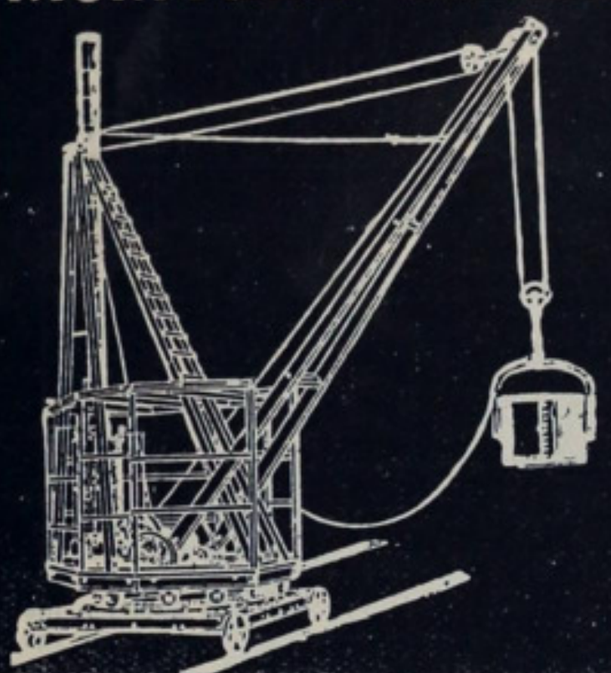

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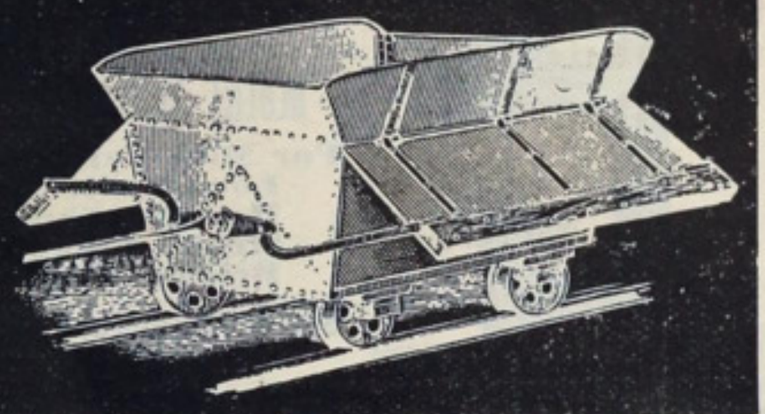

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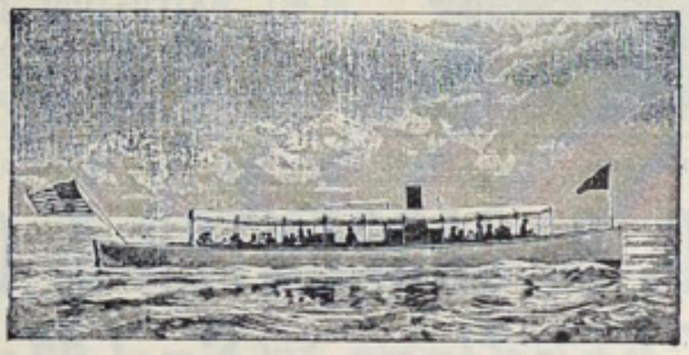

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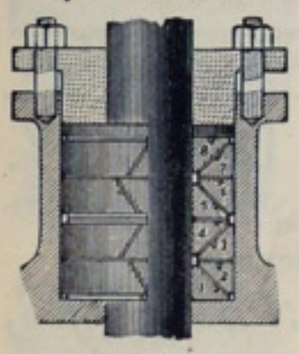

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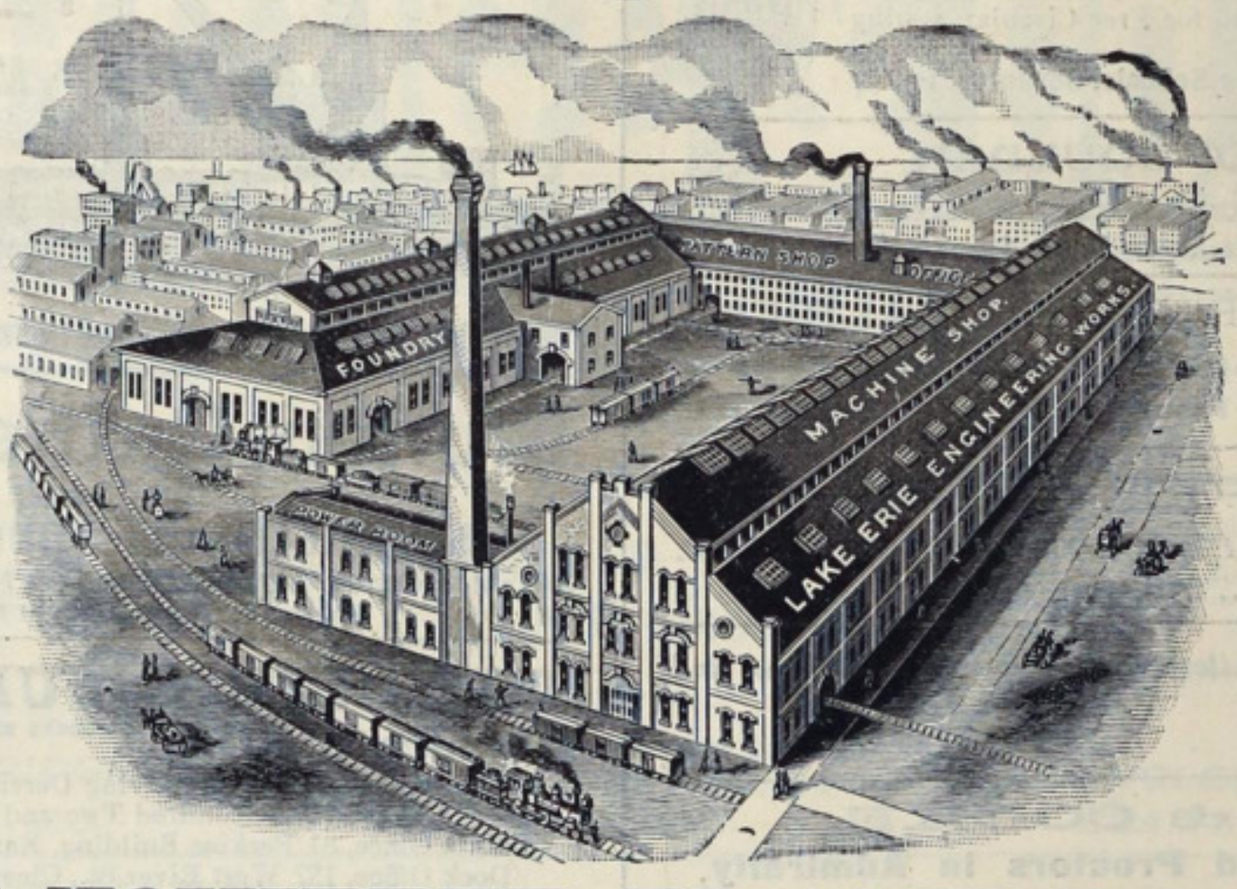

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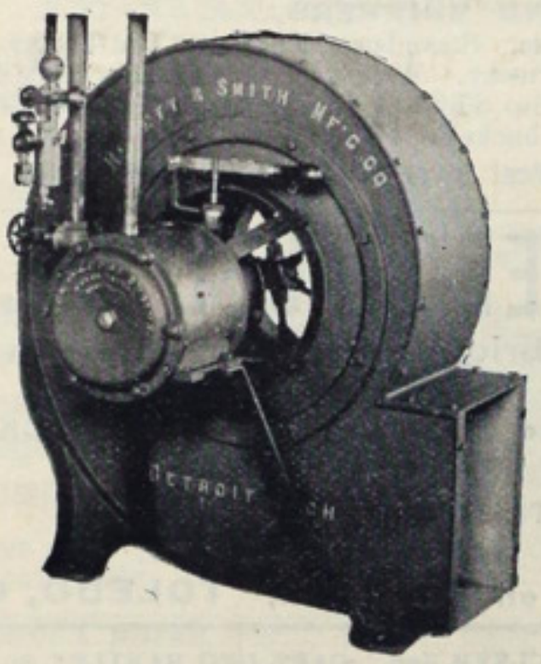

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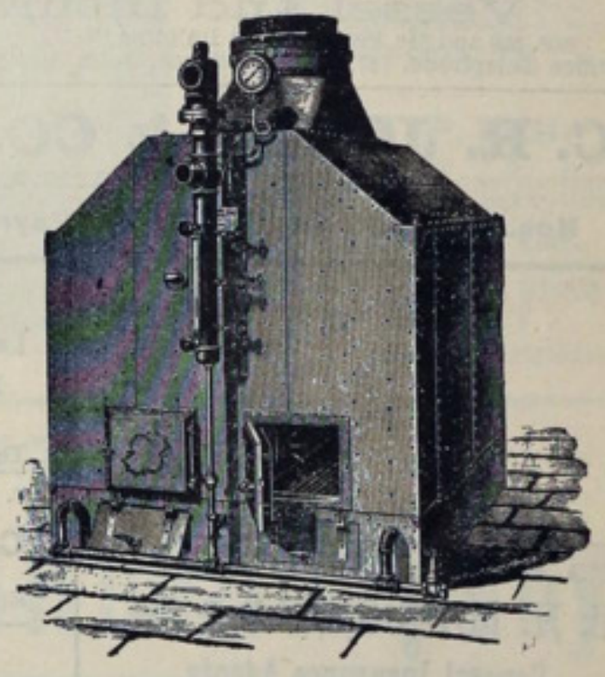

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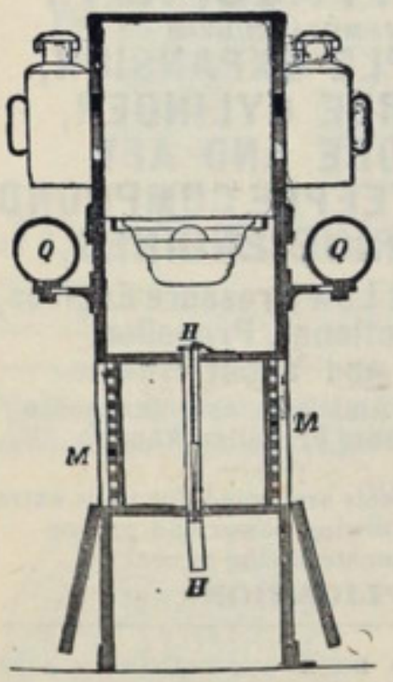

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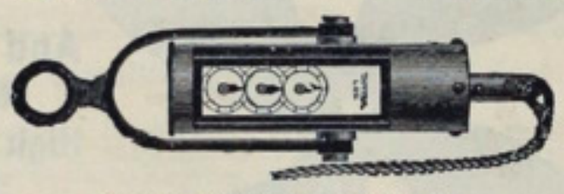

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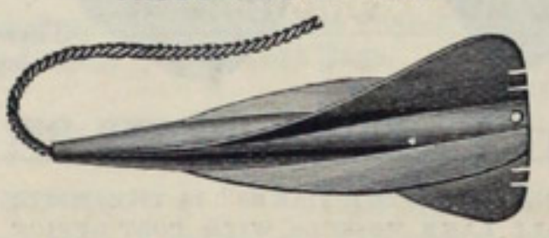

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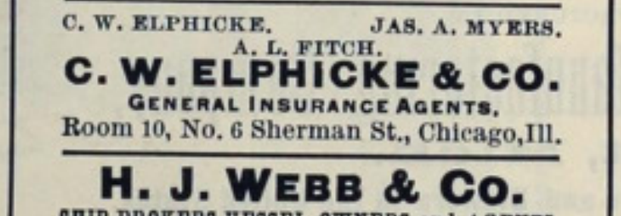

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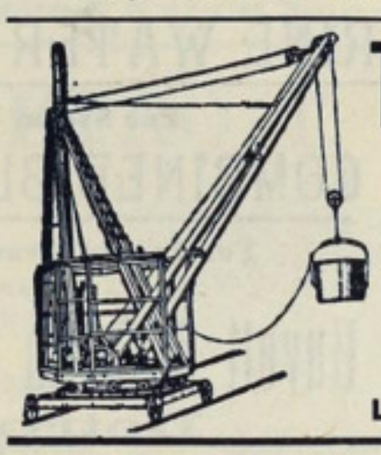

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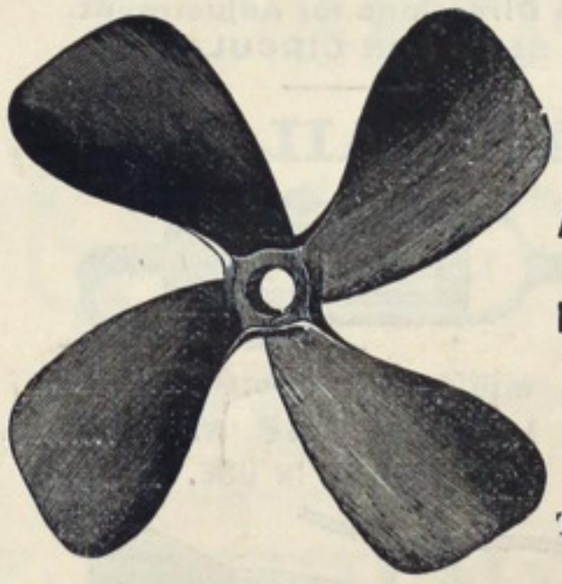

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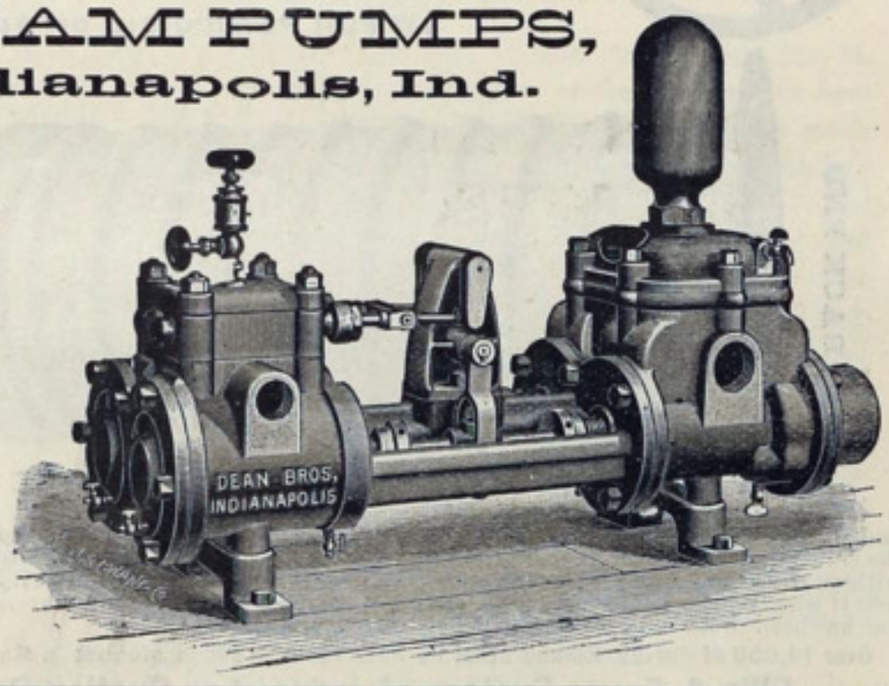

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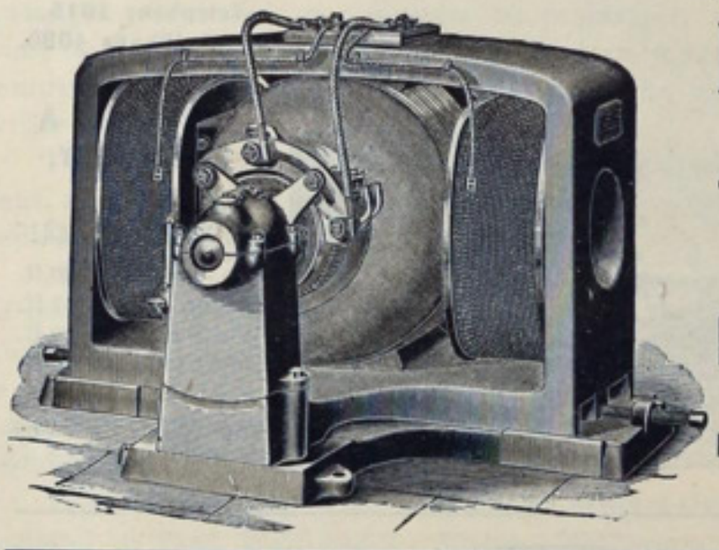

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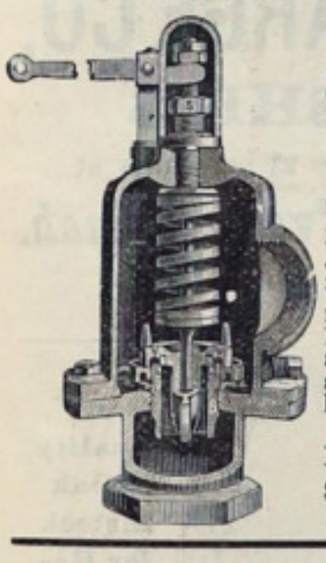

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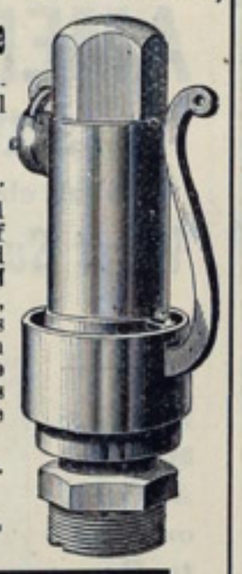

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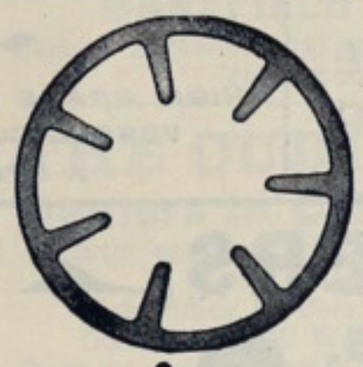

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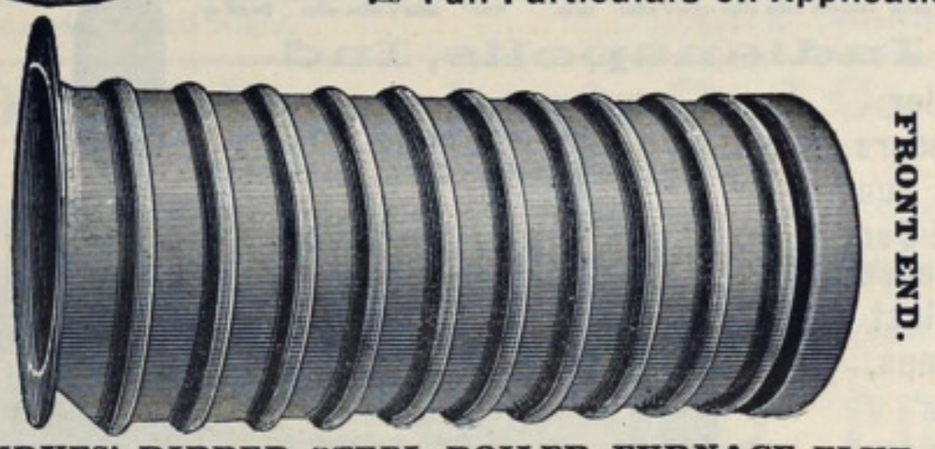

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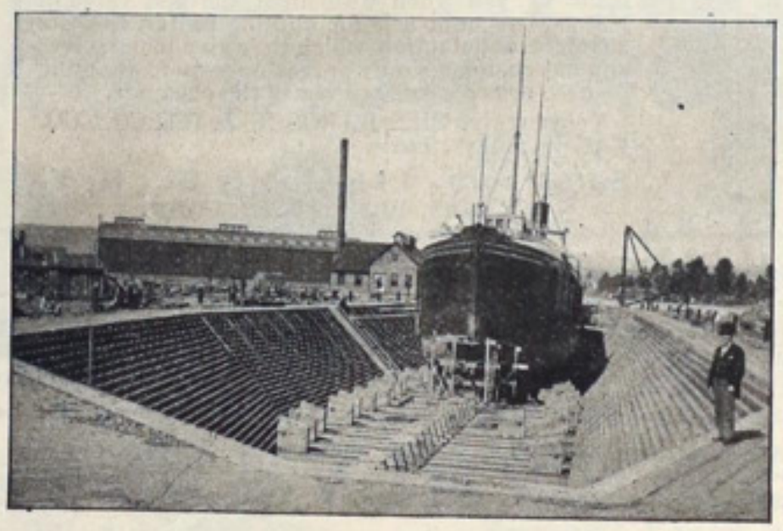

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